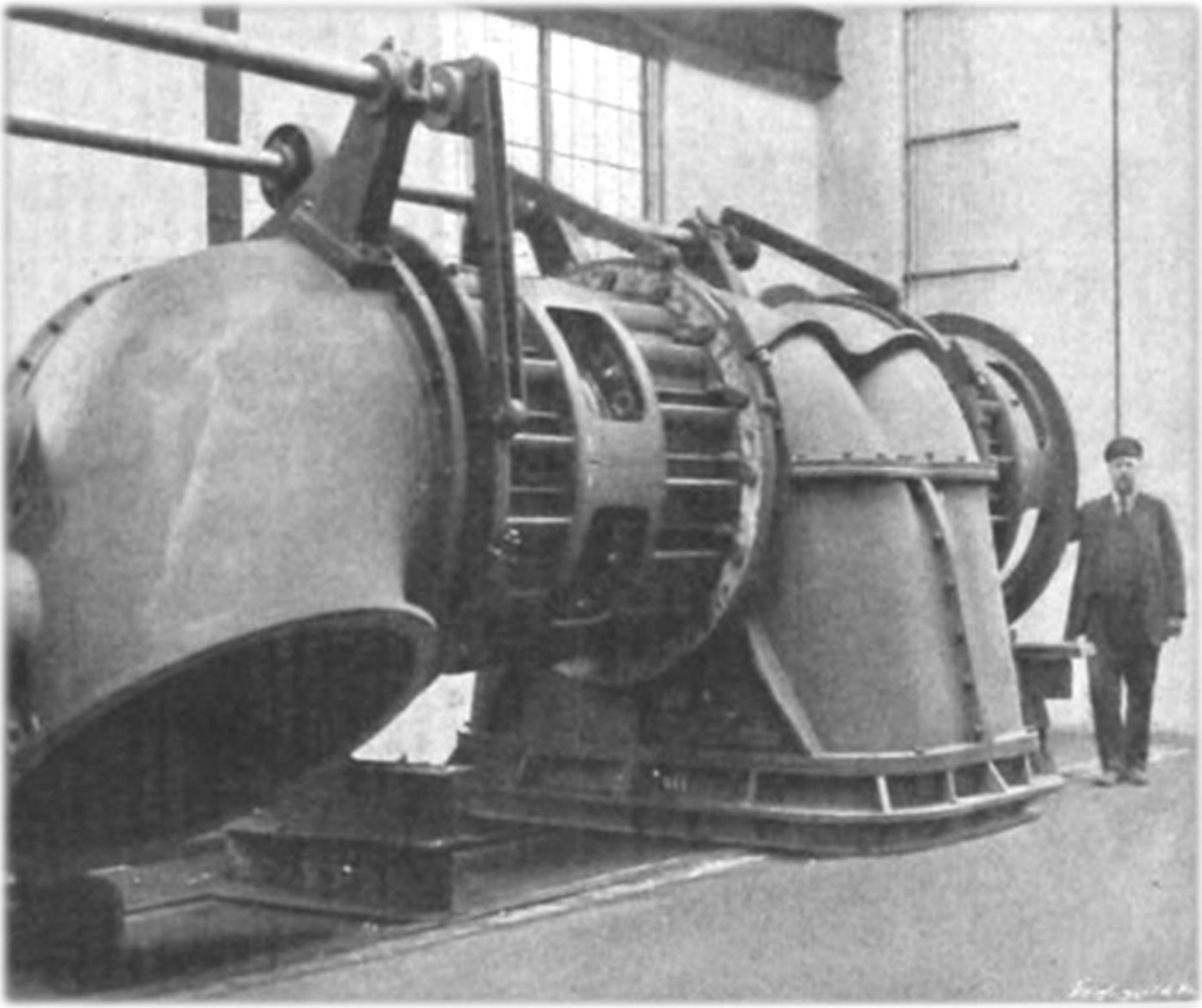
DRAFT EDITION

November 2025

TURBINE TOPICS

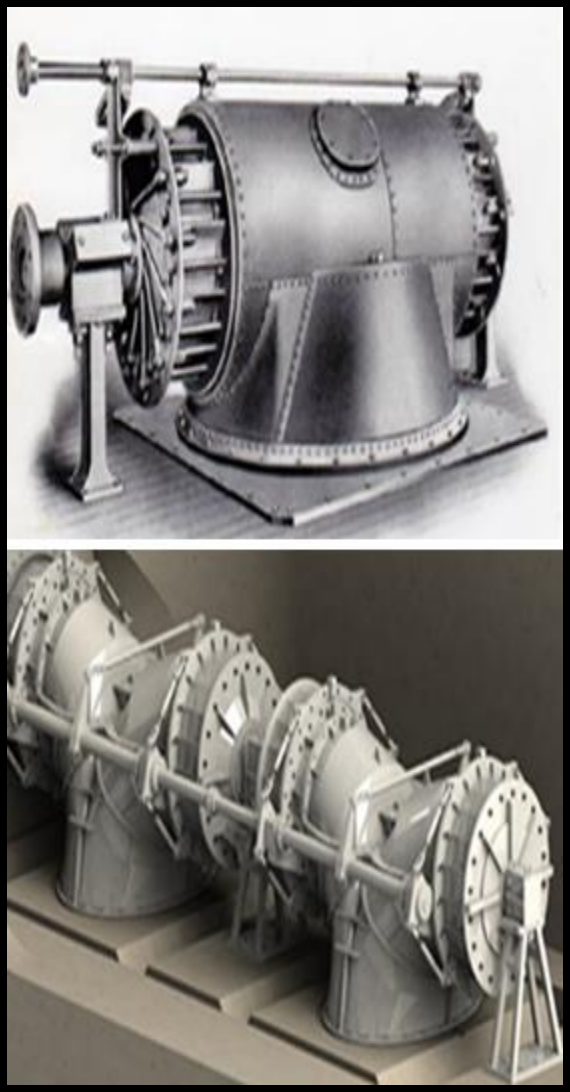
Volume 1 Issue 1



Vertical Camelback Applications

Multi-turbine solutions

Cammel back turbines, depending on your experiences, you either love them or hate them. Regardless, the concept behind the design is straightforward: if you have a lower available head but plenty of flow, utilizing multiple turbines simultaneously can help you develop the power that you are looking for. Normally, when we think of camelbacks, we think of the well-known double-horizontal and quad configurations shown here. However, other unique configurations utilize multiple turbines to generate mechanical power. While utilizing multiple runners is a unique idea, today we explore the more curious applications where multiple runners were situated on a common vertical shaft.



Top: Leffel Turbine
Bottom: Norcan mockup

Vertical Camelback's

Vertical camelback units are a bit of a rarity and are widely unknown to those outside of the very few facilities that are still home to these units. For the time, vertical camelback units had their benefits. Building vertically could allow for a narrower overall powerhouse in applications where space is limited. From a water usage standpoint, in low-head applications, more flow could be utilized to make up for available head limitations.

While this was not a hugely popular option, multiple manufacturers such as S. Morgan Smith, I.P Morris, Maschinenfabrik Esslingen, Escher Wyss, Alice Chalmers, and likely others at different points in time all constructed their own versions of this unique design.

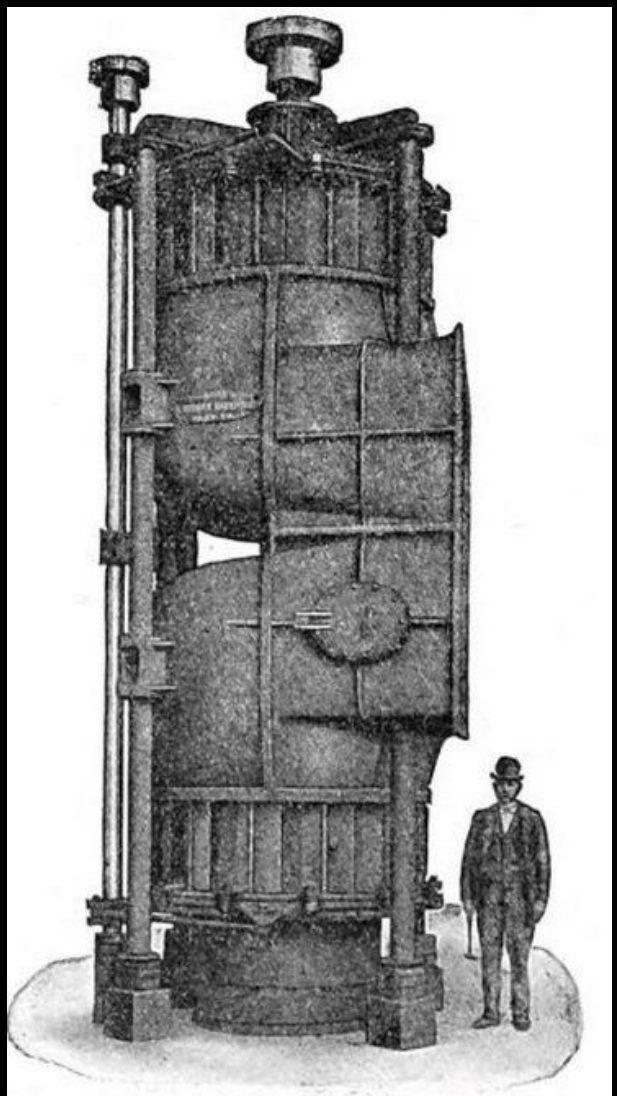
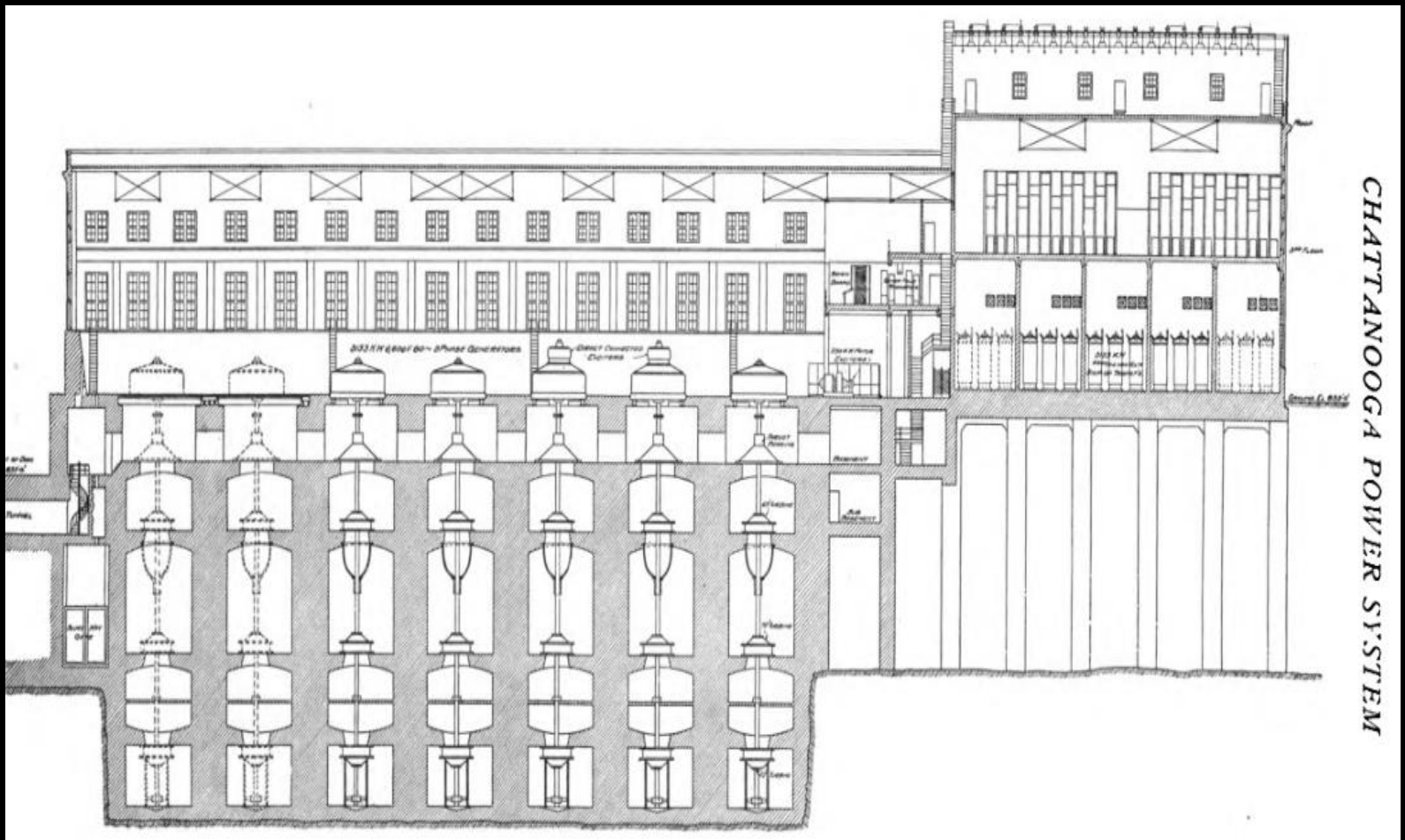


Fig. 326.—Double Vertical Unit Built by the S. Morgan Smith Co.

Interesting History:
A double turbine was utilized in a unique mining application as a forward / reversing method. Water was directed by a gate to either the upper CW or lower CCW turbine to reverse the direction of shaft rotation.

Vertical Camelback's

While from manufacturer to manufacturer, the general builds were similar in nature, the number of turbines installed at different locations varied, with most applications having two or three turbines per shaft. It is not beyond the realm of possibility that there were installations out there that may have gone as far as using four turbines, a wild concept.



CHATTANOOGA POWER SYSTEM

Fig. 108.—Longitudinal Section D-D, Hales Bar Station, Chattanooga & Tennessee River Power Co. (See Fig. 107.)

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Vertical Camelback's

So, what facilities used vertical turbines in this fashion? While this was a difficult topic to research, it did yield some results. Though I suspect there are more of these historic marvels out there. From my research, a handful of facility profiles were located showing these unique installations, all of which are a bit curious in their own way. As we close out this Turbine Topic please enjoy a collection of facility cutaways, and thank you for staying curious.

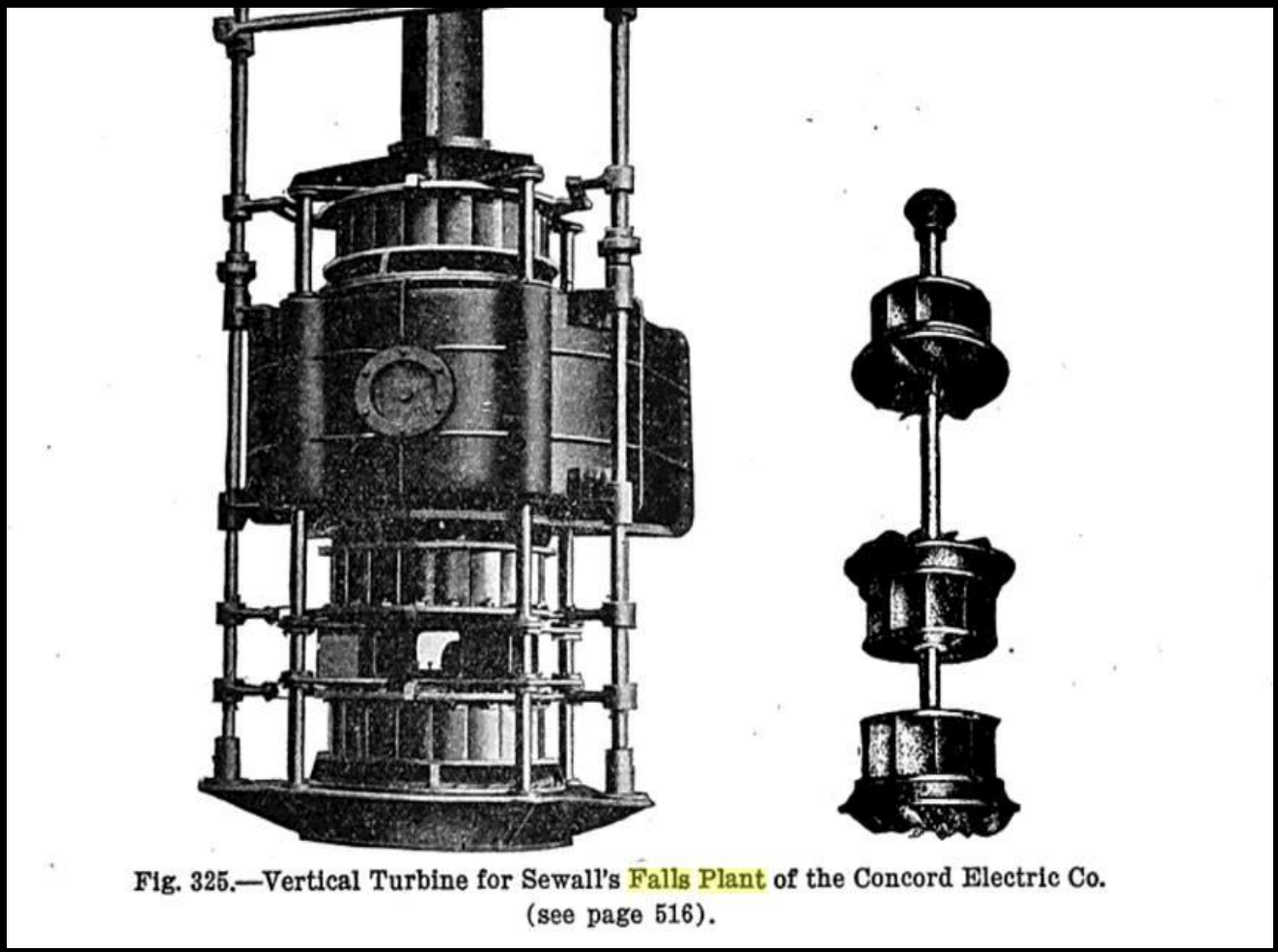
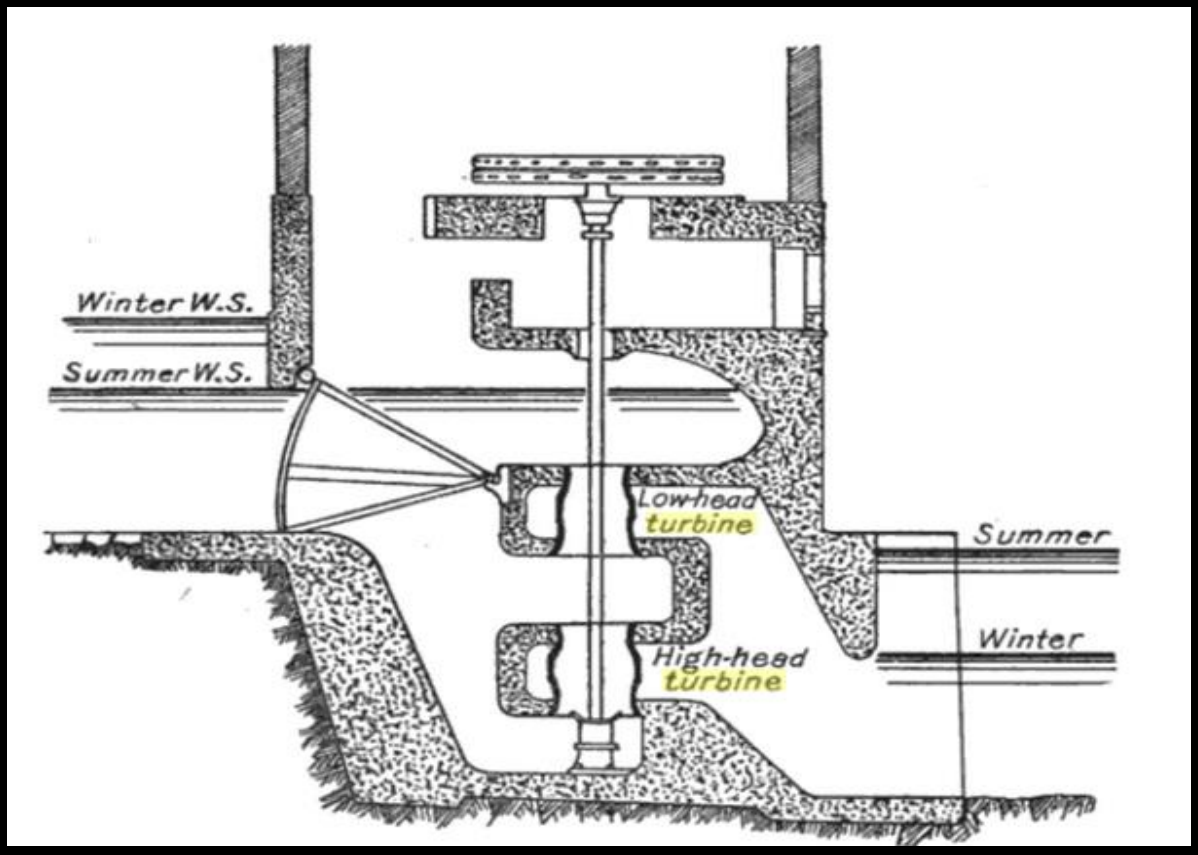
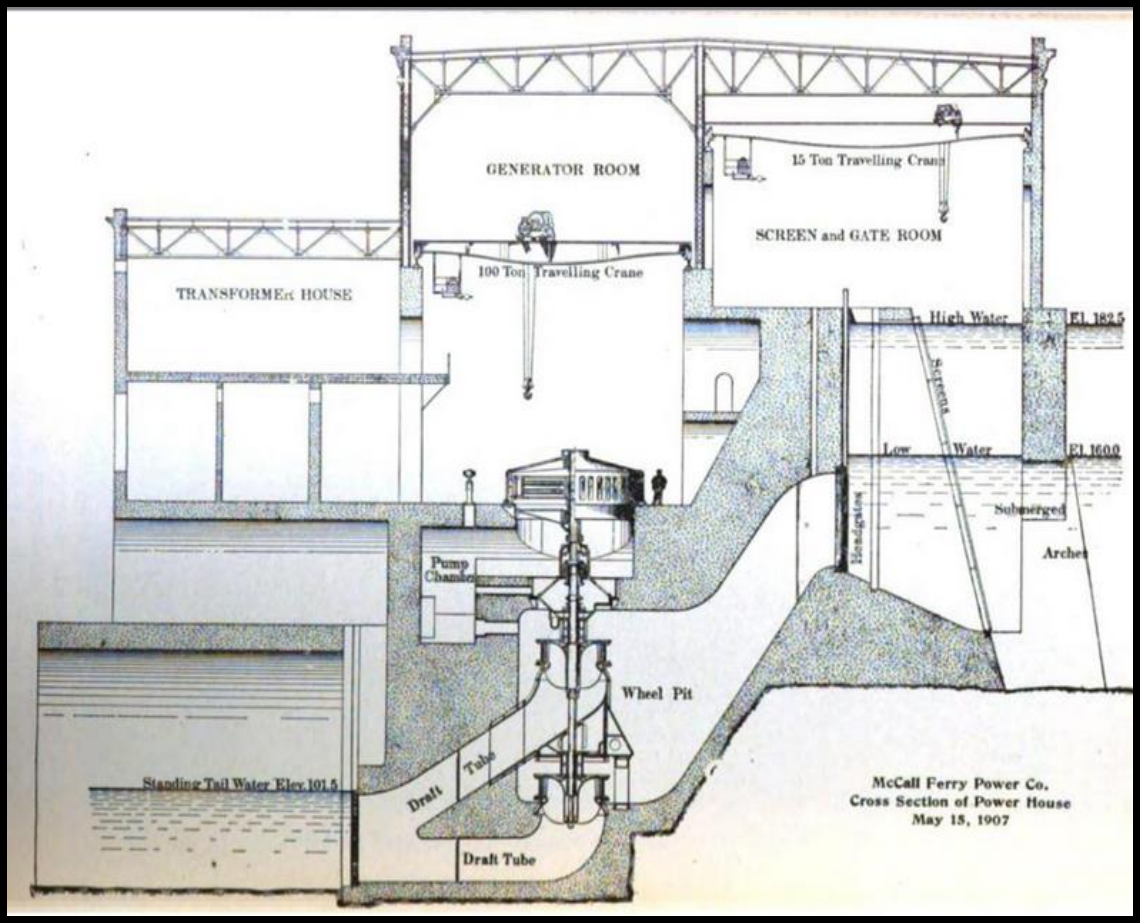


Fig. 325.—Vertical Turbine for Sewall's Falls Plant of the Concord Electric Co.
(see page 516).

Vertical Camelback's

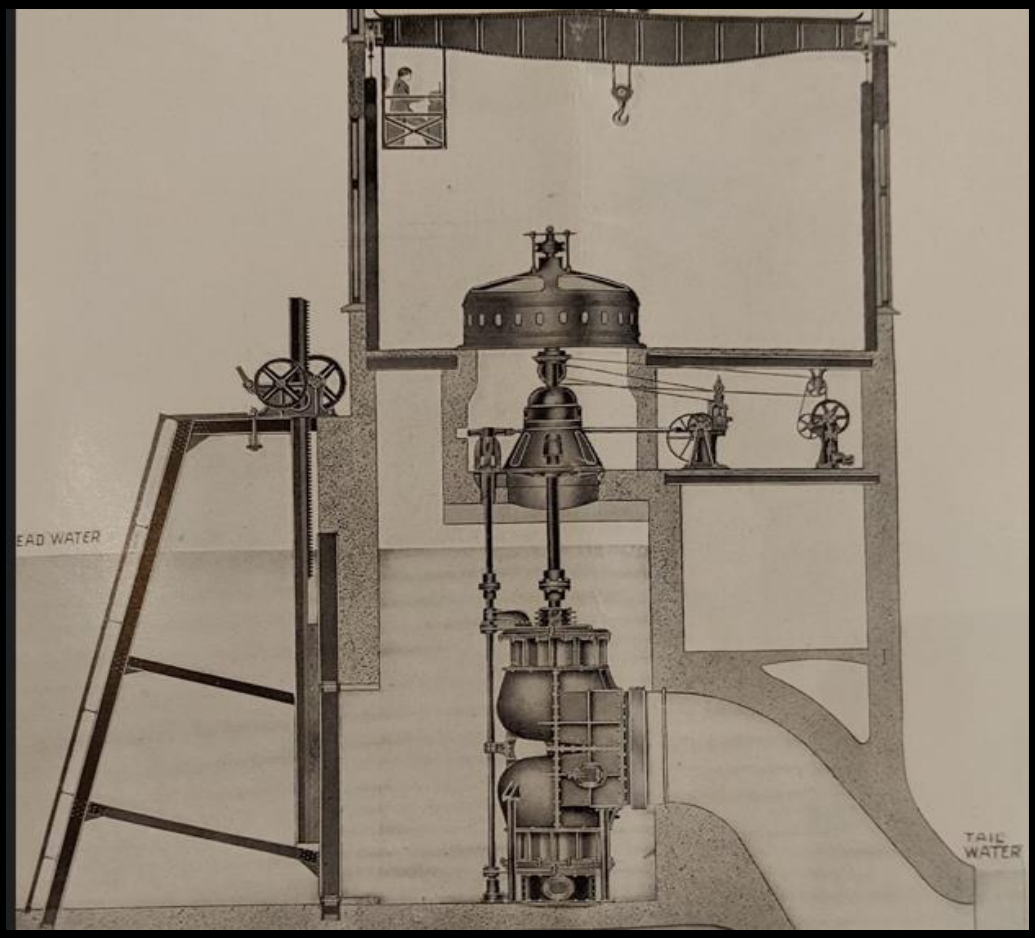


Chevres, Switzerland

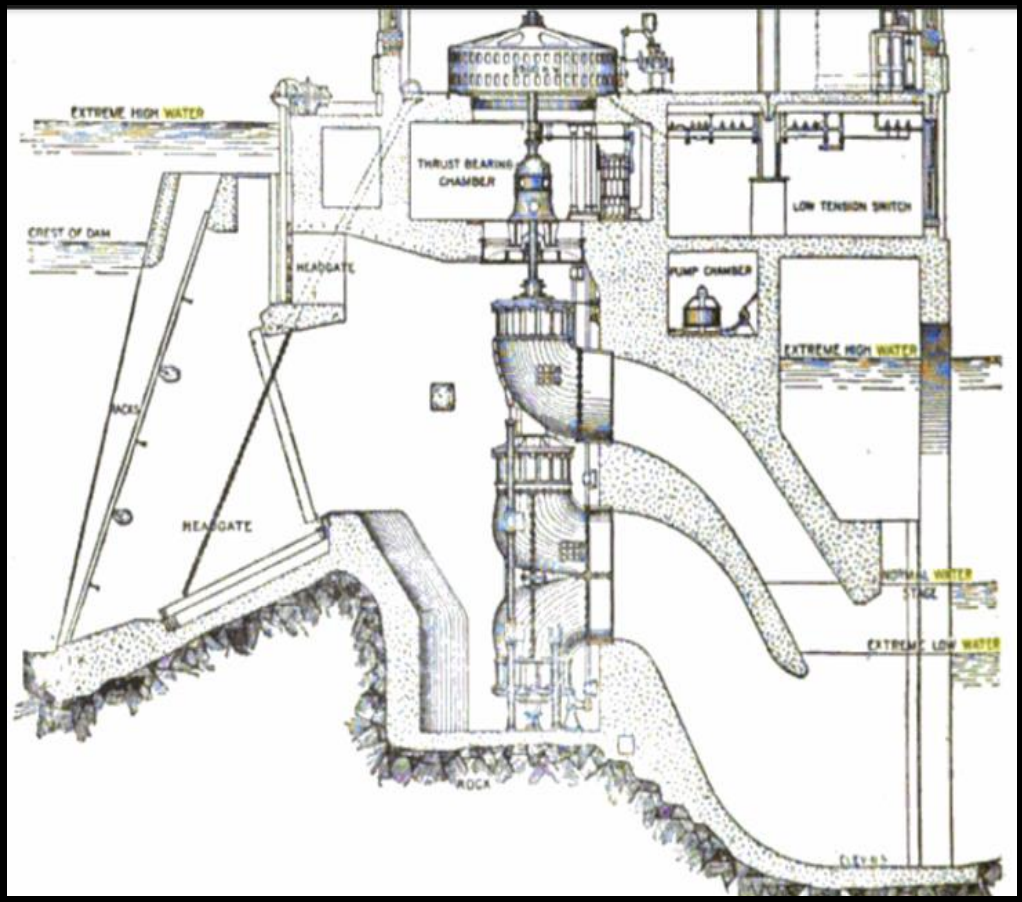


Holtwood Dam, Pennsylvania

Vertical Camelback's

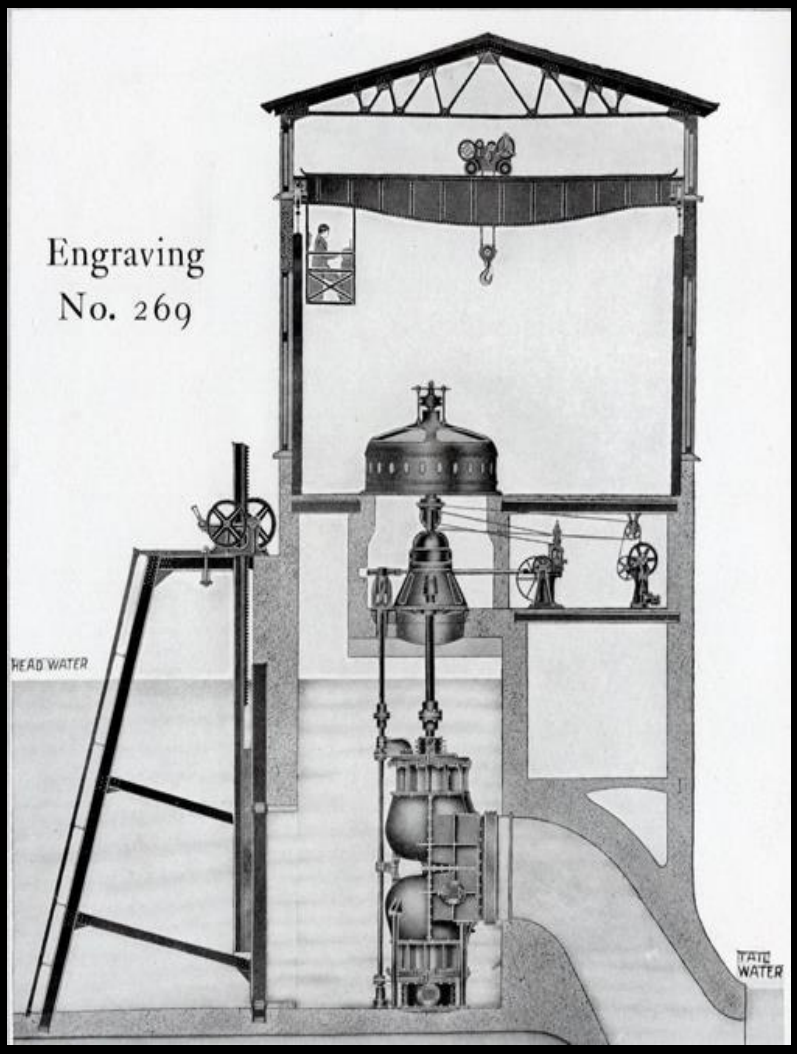


Connecticut River Power Station, VT



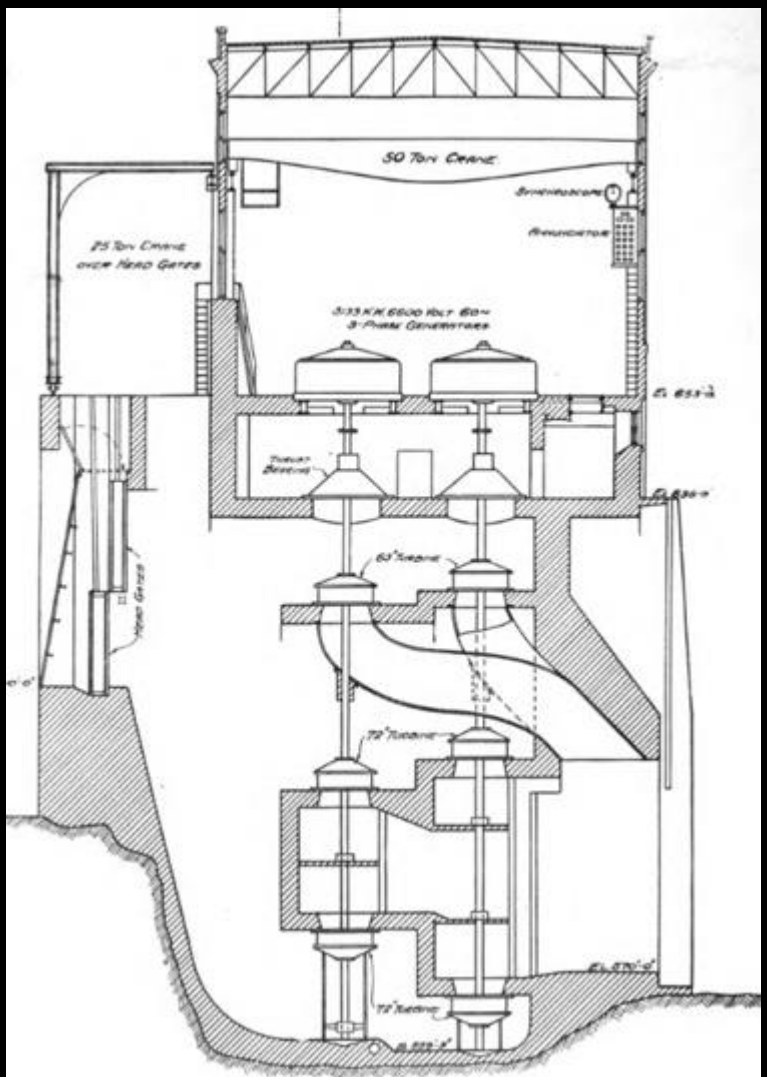
Philadelphia Hydro Electric Company, PA

Vertical Camelback's



Left

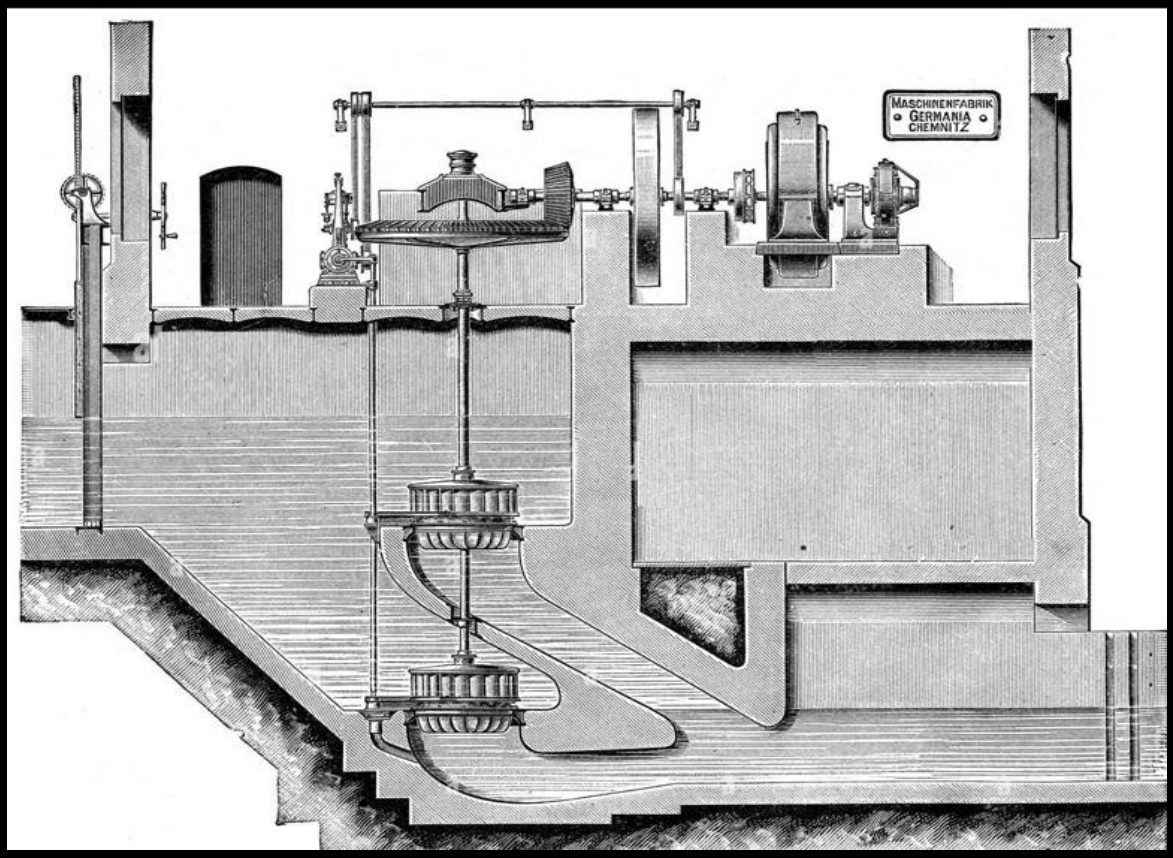
Unknown
Facility
Milford, ME



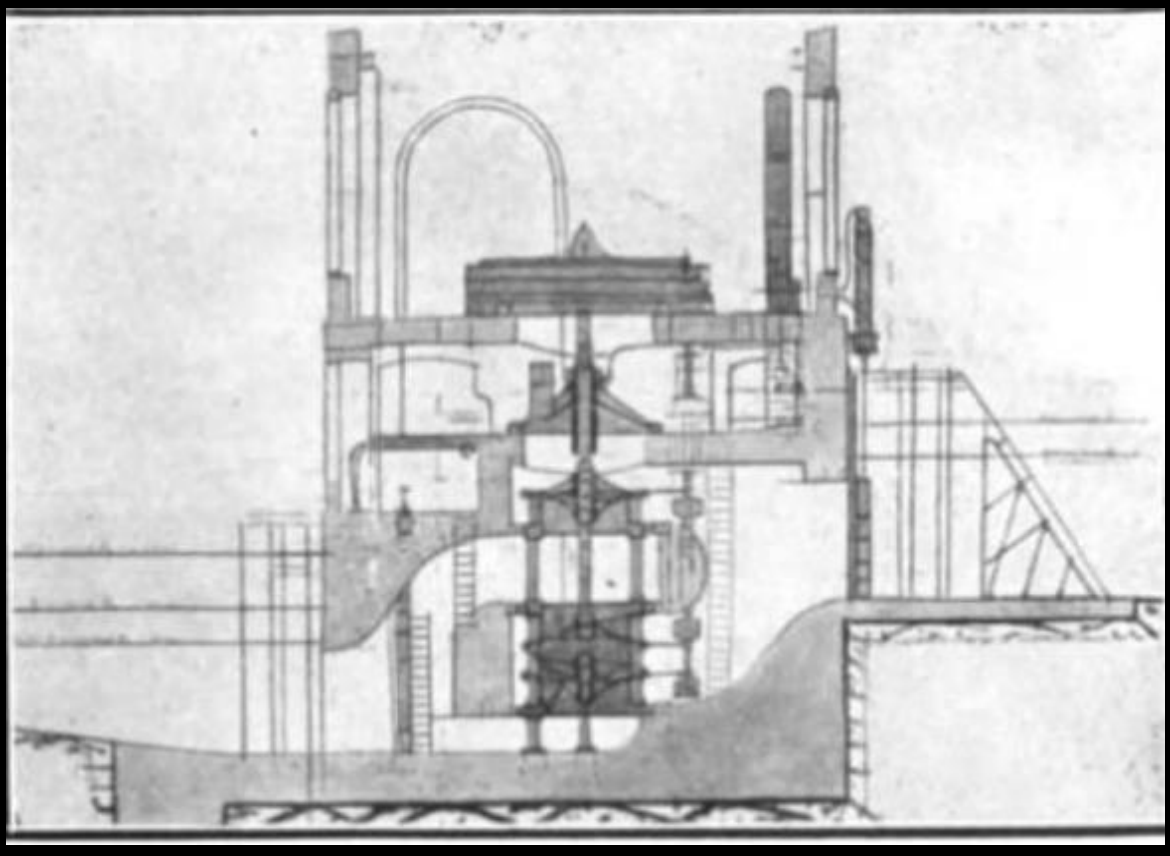
Right

Hales Bar
Tenn.

Vertical Camelback's

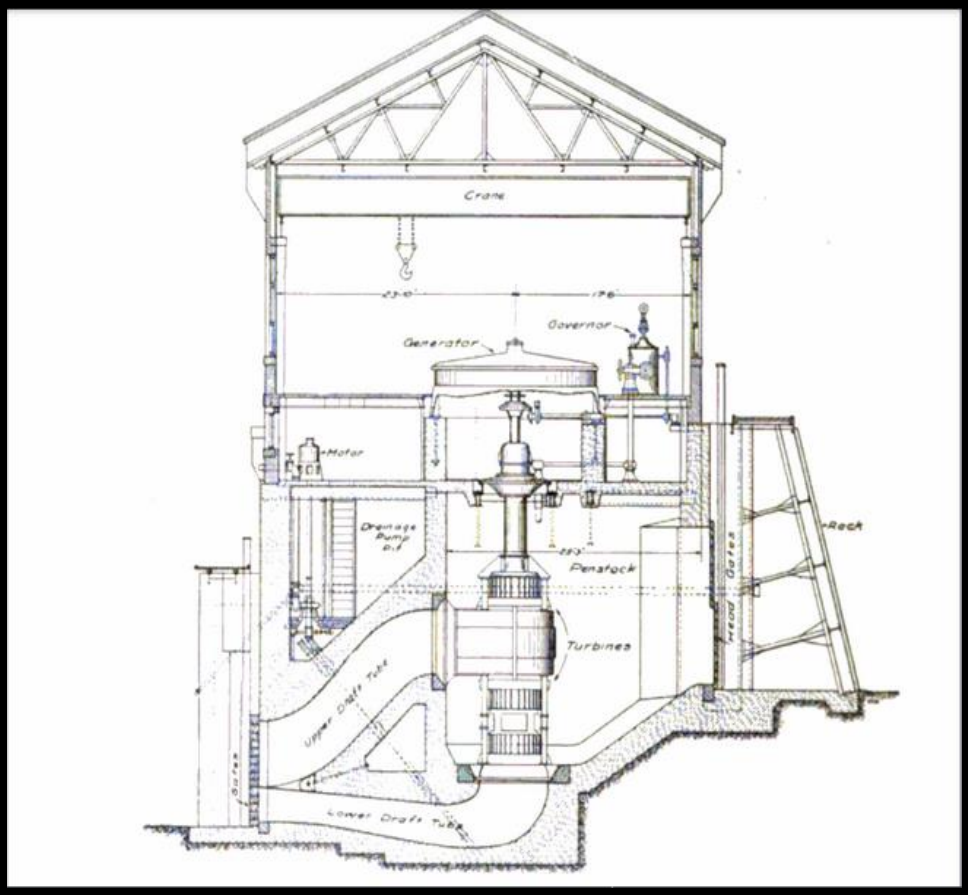


Unknown
Facility
Germany



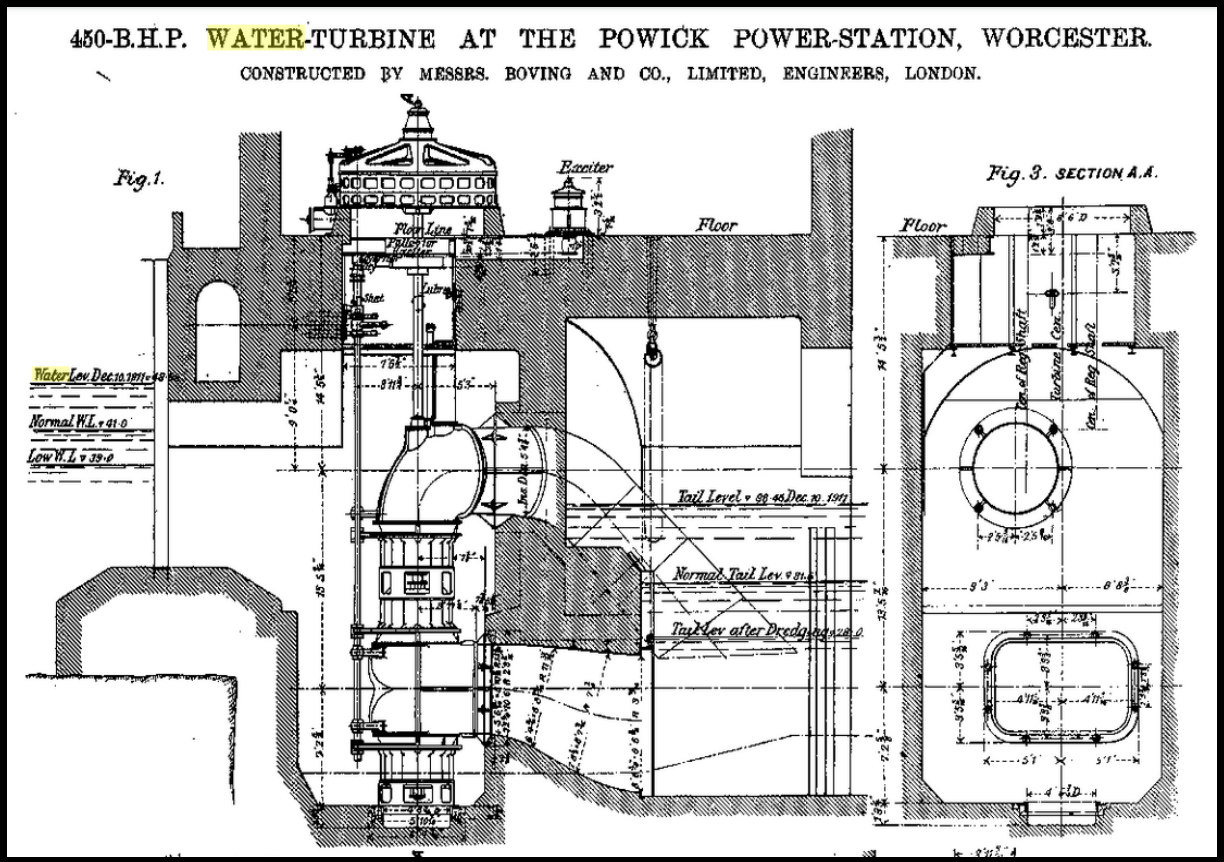
Benzau,
Switzerland

Vertical Camelback's



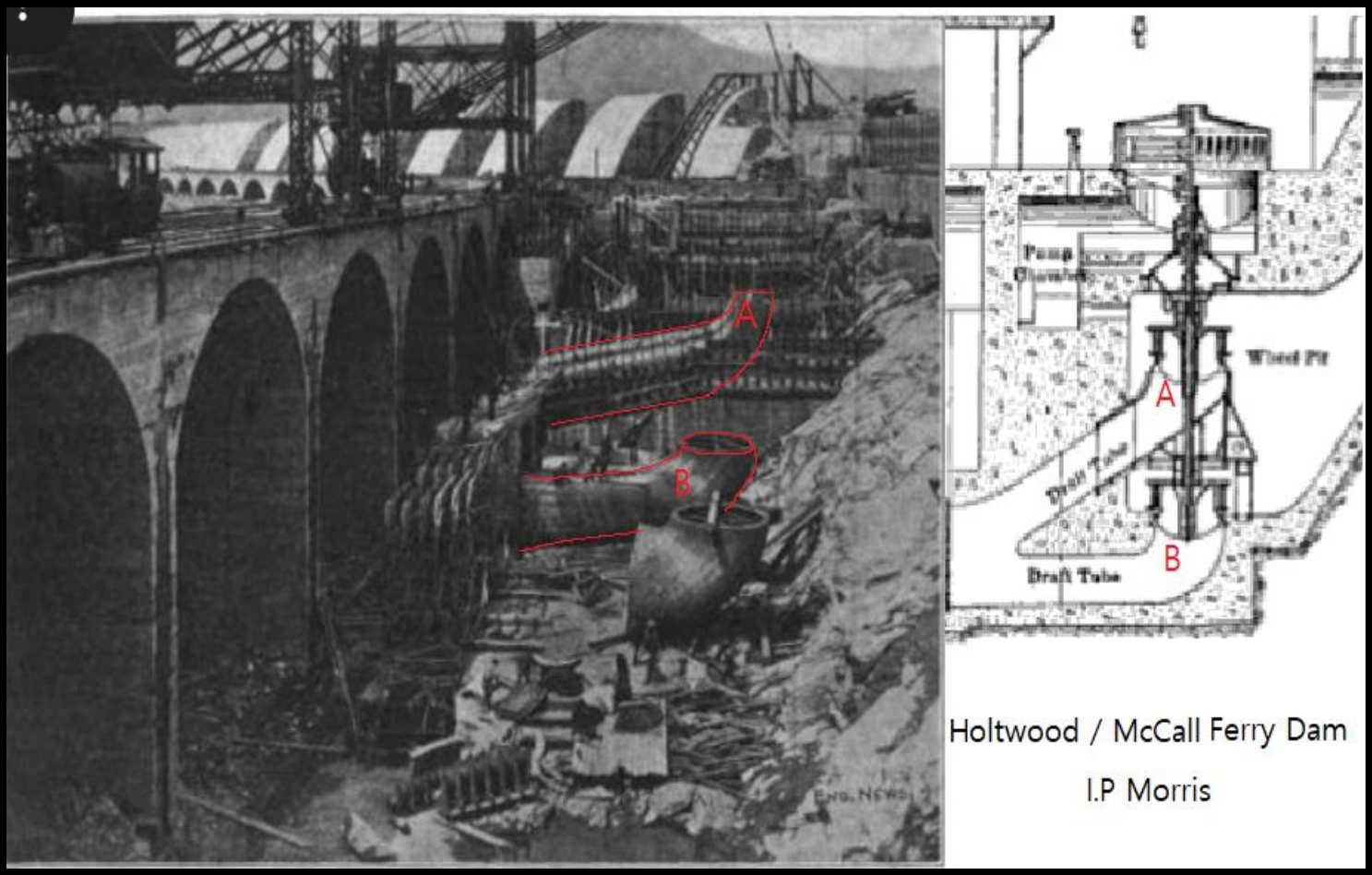
Seawalls's Hydro Station, Concord Electric Co.

Worchests, London


450-B.H.P. WATER-TURBINE AT THE POWICK POWER-STATION, WORCESTER.
CONSTRUCTED BY MESSRS. BOVING AND CO., LIMITED, ENGINEERS, LONDON.
Fig. 1.
Exciter
Floor
Fig. 3. SECTION A.A.
Floor
Water Lev. Dec. 10, 1911 = 48·0
Normal W.L. = 41·0
Low W.L. = 39·0
Tail Level = 28·48 Dec. 20, 1911
Normal Tail Lev. = 31·0
Tail Lev. after Dredging = 28·0

Closing Thoughts

A special thank you to all the members of Turbine Topics, both on Facebook, locally, and on LinkedIn.. It is through a group effort that we continue to grow and spread the word about hydropower, uniting both the new and the historically interesting. By sharing knowledge and stories, we keep history alive and possibly inspire the next generation of industry professionals.



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